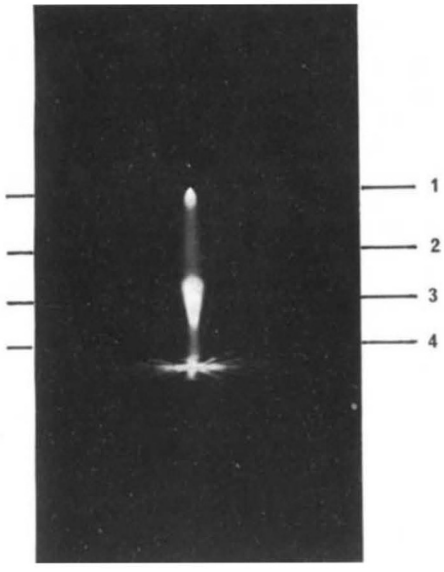
# CORRESPONDENCE

## Ball lightning in the laboratory

SIR — Sir Brian Pippard's account of ball lightning observed outside the Cavendish Laboratory[1] is the latest of many reported sightings of this phenomenon. Unfortunately, Nature is not an obliging wench[2] and men generally experience her performance no more than once in a lifetime. Thus descriptions garnered from single momentary unexpected glimpses tend to be inexact and unscientific; if the fireball be the angular size of the Moon[1], what is its diameter? I would like therefore to draw attention to the possibility that some photographs we published[3] some years ago were in fact of a laboratory version of ball lightning.

The work was a consequence of some peripheral observations we made while developing a streamer chamber[4] for cosmic ray studies. Originally we discovered a ringing phenomenon superimposed on the Lichtenberg figures that appeared on the insulated bottom of the chamber and centred on the particle tracks[5]. This was with a chamber filled with the noble gas mixture of 70 per cent neon and 30 per cent helium. These dark rings could manifest themselves as dark spaces in a columnar discharge[6] and the advance of the discharge could be studied by arresting the field and photographing the various stages[7]. It was when we extended the work to air[3] that a new effect emerged which may now shed light on the nature of ball lightning.

The photograph shows the electrical discharge resulting from the application of a modulated positive potential to the wire with the lower plate earthed. The initial rise of the impulse causes field emission at the wire tip, and the plasma develops downwards. The precise nature of this advance is not understood; the main agents of discharges are electrons that participate in Townsend avalanches but which here can only move upwards and so some photoionization mechanism must be assumed. The downward velocity of the luminous front is of the order of $5 \times 10^5$ m s$^{-1}$.




*Photograph of the discharge corresponding to the positive high voltage pulse applied to the wire electrode (invisible here).*

The curiosity here is the well-defined luminous cone seen in the photograph (region 3), for which we have seen no counterpart in noble gases. The photomultiplier trace[8] shows that light is emitted synchronically with the oscillations of the applied voltage — even though the adjacent regions[2,3] emit essentially only once when the discharge front traverses. The cone is seen to be a stationary, stable, localized fireball maintained by the electric field. If the field oscillations were allowed appropriately to continue for seconds, one might suppose the emission from the plasma cone would similarly continue.

The similarity between the suspended cone of plasma and ball lightning prompts the hypothesis that ball lightning itself is maintained by an oscillatory atmospheric electric field. The reason for the localized containment of the plasma is an unanswered question, but one which is now open to experimental study in the laboratory. Ball lightning moves gently and one must presume that this is in response to the site of the advantageous field conditions itself moving. In that discharge phenomena tend to be a function of the ratio $E/p$, the higher atmospheric pressure would imply higher electric fields.

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2. Tonks, L. *Nature* **187**, 1013 (1960).
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4. Rice-Evans, P. *Spark Streamer, Proportional and Drift Cambers* (Richelieu, London, 1974).
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## ICSU matters

SIR — In view of the factual errors in "Doing one's thing" Nature 16 September, p.194, I should be grateful if you would publish the following:

(1) Discussions have been taking place with representatives of the China Association for Science and Technology and the Academy located in Taipei, China, for the past ten years to prepare the terms of an agreement that would be acceptable to all three parties and would make it possible for both organizations to be members of ICSU with the right to vote. These were successfully completed on 15 September, as Vera Rich indicates in your issue of 23 September.

(2) The communication from the Government of Australia to the Australian Academy is quite specific and does not give "terms of reference wide enough, etc". It did not add the proviso that "in future it should have a hand in planning *conferences* of this kind". To which kind of conferences do you refer?

(3) Sir John Kendrew was elected as first *Vice-President* for two years. He will become *President* in *1984* for *four* years.

(4) If ICSU is "short of money" it is because of a general shortage of money in the academic world, which provides most of the funds for ICSU, not because "it is trying to accomplish goals for which it was not created".

Further, in relation to "Academies not international" (23 September, p.288), the argument from which the predecessor of ICSU, the International Research Council (IRC) and ICSU spring is: the coordination of international efforts in the different branches of science and its applications.

Today ICSU's ultimate objectives include "to encourage international scientific activities for the benefit of mankind and so promote the cause of peace and international security throughout the world", and in pursuing these objectives ICSU observes a basic policy of non-discrimination — it affirms "the rights of scientists throughout the world to adhere to or to associate with international scientific activity without regard to race, religion, political philosophy, ethnic origin, citizenhip, language or sex". The withdrawal of Taiwan was not an acceptable solution.

ICSU does not have and does not need a UN sponsor. As an organization expands, which ICSU has done in the past three decades (10 new International Scientific Unions, 26 new National Members, 17 new Scientific Associates, 4 new National Associates Biological Programme, the Upper Mantle Programme, the world Scientific and Technical Information Study jointly with Unesco, the Global Atmospheric Research Programme jointly with WMO, etc), paperwork expands . . . as has the number of printed pages about scientific discoveries in the past three decades.

"The state of affairs" about which your article says ICSU should be worrying seems to be pure politics: an area ICSU tries to avoid — "tries" is put purposively because it is not possible for any organization, not even a non-governmental organization, to escape from the effects of politics and governments' policies.

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(1) Agreed; we said so twice.
(2) The Australian government has asked the Australian National Academy of Science to consult on future international conferences.
(3) We are grateful for this correction.
(4) A matter of opinion, linked with the question raised in the article "Science not international" of whether ICSU would be more effective in its laudable fight against discrimination if it were organized differently.

EDITOR *NATURE*